

## ADVANCED WELDING APPLICATIONS AND CERTIFICATION

### COURSE DESCRIPTION

*Advanced Welding Applications and Certification\** is a course designed to follow *Basic Principles of Welding*, in which students will learn more advanced techniques and skills related to cutting and welding applications. Welding and cutting skills developed in *Introduction to Welding* and *Basic Principles of Welding* will be used to satisfactorily complete a series of industry certification tests. Following the completion of this course, including successful passage of the industry certification tests, the student should be certified as an *Entry Level Welder* as defined by American Welding Society QC10.

*It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.*

<b>Recommended:</b>	Introduction to Welding Basic Principles of Welding
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<b>Recommended Credits:</b>	2
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<b>Recommended Grade Level(s):</b>	11 <sup>th</sup> or 12 <sup>th</sup>
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<b>Number of Competencies in Course:</b>	49
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**Note:** \*This course may be offered as a part of the Construction or the Manufacturing Sub-Clusters, depending upon the student's career focus. (Construction Core is recommended for students in the Construction Sub-Cluster, but it is not recommended for students in the Manufacturing.)

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARDS**

- 1.0** Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.
- 4.0** Students will analyze quality control procedures and implement nondestructive examination methods
- 5.0** Students will take industry certification tests using the shielded metal arc welding (SMAW) process.
- 6.0** Students will make complete joint penetration groove welds on plain carbon steel in all positions using short-circuit, spray transfer, or pulsed-arc gas metal arc welding (GMAW) process.
- 7.0** Students will make complete joint penetration groove welds on plain carbon steel in all positions using the flux cored arc welding (FCAW) process.
- 8.0** Students will make complete joint penetration groove welds on various metals in all positions using the gas tungsten arc welding (GTAW) process.

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 1.0**

Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.

### **LEARNING EXPECTATIONS**

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues
- 1.10** Pass with 100% accuracy a performance examination relating to safety.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

### **PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET**

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, or alcohol.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.3D** Properly places and secures ladders and scaffolding prior to use.
- 1.4A** Is observant of personnel and activities in the vicinity of the work area.
- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.
- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets) and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.

- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8** Complies with personal assignments regarding emergency assignments.
- 1.9** Passes with 100% accuracy a written examination relating specifically to content area.
- 1.10** Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.
- 1.11** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

### **SAMPLE PERFORMANCE TASKS**

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Conduct a practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of a student conducting a hazardous activity and note the level of awareness demonstrated by the student.
- For a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by students.

### **INTEGRATION LINKAGES**

Language Arts, Mathematics, Algebra, Geometry English, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 2.0**

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

### **LEARNING EXPECTATIONS**

The student will:

- 2.1** Cultivate positive leadership skills.
- 2.2** Participate in the student organization directly related to their program of study as an integral part of classroom instruction.
- 2.3** Assess situations, apply problem-solving techniques and decision-making skills within the school, community, and workplace.
- 2.4** Participate as a team member in a learning environment.
- 2.5** Respect the opinions, customs, and individual differences of others.
- 2.6** Build personal career development by identifying career interests, strengths, and opportunities.

### **PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET**

The student:

- 2.1A** Demonstrates character and leadership using creative-and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of their student organization, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the Professional Development Program or career and technical student organization materials directly related to the student’s program of study to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, gender, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resume that reflects student’s skills, abilities, and interests.

## **SAMPLE PERFORMANCE TASKS**

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various career and technical student organizations' programs and/or competitive events.
- Implement an annual program of work.
- Prepare a meeting agenda for a specific career and technical student organization monthly meeting.
- Attend a professional organization meeting.
- Develop a program of study within their career opportunities.
- Participate in the American Spirit Award competition with SkillsUSA.
- Complete *Professional Development Program Level I and Level II*, SkillsUSA.

## **INTEGRATION LINKAGES**

SkillsUSA, *Professional Development Program*; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; English; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary's Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary's Commission on Achieving Necessary Skills (SCANS), American Welding Society

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 3.0**

Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.

### **LEARNING EXPECTATIONS**

The student will:

- 3.1** Assume responsibility for accomplishing classroom assignments and workplace goals within accepted time frames.
- 3.2** Develop advanced study skills.
- 3.3** Demonstrate and use written and verbal communication skills.
- 3.4** Read and understand technical documents such as regulations, manuals, reports, forms, graphs, charts, and tables.
- 3.5** Apply the foundations of mathematical principles such as algebra, geometry, and advanced math to solve problems.
- 3.6** Apply basic scientific principles and methods to solve problems and complete tasks.
- 3.7** Demonstrate an understanding of computer operations and related applications to input, store, retrieve, and output information as it relates to the course.
- 3.8** Research, recognize, and understand the interactions of the environment and *green* issues as they relate to the course work and to a global economy.

### **PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET**

The student:

- 3.1A** Uses appropriate time management to achieve goals.
- 3.1B** Arrives at school on time each day.
- 3.1C** Completes assignments and meets deadlines.
- 3.2A** Assesses current personal study skills.
- 3.2B** Demonstrates advanced note-taking ability.
- 3.2C** Formulates appropriate study strategies for given tasks.
- 3.3A** Communicates ideas, information, and messages in a logical manner.
- 3.3B** Fills out forms, time sheets, cards, reports, logs, and documents to comply with class and project requirements.
- 3.4A** Reads and understands technical documents and uses industry jargon, acronyms, and terminology appropriately.
- 3.4B** Recognizes the meaning of specialized words or phrases unique to the career and industry.
- 3.5A** Utilizes computation in adding, subtracting, multiplying, and dividing of whole numbers, fractions, decimals, and percents.
- 3.5B** Chooses the right mathematical method or formula to solve a problem.
- 3.5C** Performs math operations accurately to complete classroom and lab tasks.
- 3.6A** Demonstrates an understanding of scientific principles critical to the course.
- 3.6B** Applies scientific principles and technology to solve problems and complete tasks.
- 3.6C** Demonstrates knowledge of the scientific method (e.g., identifies the problem, collects information, forms opinions, and draws conclusions).

- 3.7A** Uses basic computer hardware (e.g., PCs, printers) and software to perform tasks as required for the course work.
- 3.7B** Demonstrates an understanding of capabilities of computers and common computer terminology (e.g., program, operating system).
- 3.7C** Applies the appropriate technical solution to complete tasks.
- 3.7D** Inputs data and information accurately for the course requirements.
- 3.8A** Researches and recognizes *green* trends in career area and industry.
- 3.8B** Examines current environmentally-friendly trends.
- 3.8C** Applies sustainability practices by understanding processes that are non-polluting, conserving of energy and natural resources, and economically efficient.

### **SAMPLE PERFORMANCE TASKS**

- Examine and compile different learning styles for portfolios.
- Create calendars containing all activities and obligations for one month. Discuss how to handle conflicting or competing obligations, then, complete daily and weekly plans showing tasks, priorities, and scheduling.
- Complete self-assessments of study habits.
- Compute precise and exact measurements.
- Explore study strategies for different subjects and tasks, then, analyze two homework assignments and select the best strategies for completing them.
- Create “life maps” showing necessary steps or “landmarks” along the path to personal, financial, educational, and career goals.
- Take notes during counselor classroom visits and work in small groups to create flow charts of the path options.
- List attitudes that lead to success, then, rate individually in these areas. Work together to suggest strategies for overcoming the weaknesses identified own and partners’ self-assessments then share with the class the strategies developed.
- Research the Internet and other resources to collect and analyze data concerning climate change.
- Keep a data file of alternative energy sources and the sources’ impact on the environment.
- Develop a recycling project at home or for the school environment.

### **INTEGRATION LINKAGES**

SkillsUSA, *Professional Development Program*; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; English; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary’s Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary’s Commission on Achieving Necessary Skills (SCANS), American Welding Society



## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 4.0**

Students will analyze quality control procedures and implement nondestructive examination methods

### **LEARNING EXPECTATIONS**

The student will:

- 4.1** Comprehend the importance of inspection and quality control in the welding industry.
- 4.2** Analyze the relationship between quality control and profitability.
- 4.3** Analyze welding codes and standards.
- 4.4** Identify weld discontinuities and defects.
- 4.5** Comprehend visual examination (VT) fundamentals.
- 4.6** Comprehend the different methods of nondestructive examination.
- 4.7** Comprehend welding procedure qualification records, welding procedure specifications, and welder qualification tests.

### **PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET**

The student:

- 4.1A** Concludes the importance of quality control and inspection.
- 4.2A** Predicts the economic impact of quality control practices.
- 4.2B** Justifies the short term costs of quality control based on long term profitability.
- 4.3A** Locates and interprets information from various codes and standards.
- 4.4A** Identifies, measures, and evaluates various weld discontinuities and defects.
- 4.5A** Describes and understands the basic principles of Visual Inspection (VT).
- 4.5B** Demonstrates the ability to perform Visual Inspection (VT) on welded joints.
- 4.6A** Describes and understands the basic principles of Magnetic Particle Inspection (MT).
- 4.6B** Describes and understands the basic principles of Liquid Penetrant Inspection (PT).
- 4.6C** Describes and understands the basic principles of Radiographic Inspection (RT).
- 4.6D** Describes and understands the basic principles of Ultrasonic Inspection (UT).
- 4.7A** Differentiates between welding procedure qualification records, welding procedure specifications, and welder qualification tests.
- 4.7B** Differentiates between essential and non-essential variables.
- 4.7C** Identifies all weld test positions.

### **SAMPLE PERFORMANCE TASKS**

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Student implements a quality control system as part of a simulated welding production company.
- Interprets weld codes and standards to inspect common welded products.
- Student will pass American Welding Society *Weld Inspection and Testing* module written exam with a minimum score of 75%.
- Using Visual Inspection (VT), inspects welded joints and interprets, measures, and records discontinuities and defects.

- Using Magnetic Particle Inspection (MT), inspects welded joints and interprets, measures, and records discontinuities and defects.
- Using Liquid Penetrant Inspection (PT) inspects welded joints and interprets, measures, and records discontinuities and defects.

### **INTEGRATION LINKAGES**

Language Arts, Mathematics, Algebra, Geometry, English, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 5.0**

Students will take industry certification tests using a shielded metal arc welding (SMAW) process.

### **LEARNING EXPECTATIONS**

The student will:

- 5.1** Identify and explain equipment, equipment setup, and electrical current that apply to shielded metal arc welding (SMAW).
- 5.2** Make open-butt groove welds in the flat position.
- 5.3** Make open-butt groove welds in the horizontal position.
- 5.4** Make open-butt groove welds in the vertical position.
- 5.5** Make open-butt groove welds in the overhead position.

### **PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET**

The student:

- 5.1A** Safely set up equipment for shielded metal arc welding.
- 5.1B** Identify and explain SMAW safety.
- 5.2** Makes a multiple-pass open-butt groove weld on plain carbon steel in the flat position.
- 5.3** Makes a multiple-pass open-butt groove weld on plain carbon steel in the horizontal position.
- 5.4** Makes a multiple-pass open-butt groove weld on plain carbon steel in a vertical position.
- 5.5** Makes a multiple-pass open-butt groove weld on plain carbon steel in an overhead position.

### **SAMPLE PERFORMANCE TASKS**

- Student will pass American Welding Society *SMAW* module written exam with a minimum score of 75%.
- Student will pass horizontal open-butt certification test per American Welding Society QC-10:2004.
- Student will pass vertical open-butt certification test per American Welding Society QC-10:2004.
- Student will pass bend tests for AWS certification on coupons. Test for quality and strength of welds.

### **INTEGRATION LINKAGES**

Language Arts, Mathematics, Algebra, Geometry, English, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 6.0**

Students will make complete joint penetration groove welds on plain carbon steel in all positions using short-circuit, spray transfer, or pulsed-arc gas metal arc welding (GMAW) process.

### **LEARNING EXPECTATIONS**

The student will:

- 6.1** Identify and explain safety procedures, equipment, equipment setup, and electrical current that apply to gas metal arc welding (GMAW).
- 6.2** Make complete joint penetration groove welds on plain carbon steel using short-circuit, spray transfer, or pulsed-arc gas metal arc welding (GMAW) process in all feasible positions.
- 6.3** Conduct guided bend tests on gas metal arc welding (GMAW) coupons.
- 6.4** Conduct nondestructive examinations such as Magnetic Particle (MT) or Liquid Penetrant Inspection (PT) on samples of GMAW weldments.

### **PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET**

The student:

- 6.1A** Safely sets up equipment for gas metal arc welding (GMAW).
- 6.1B** Identifies and explains gas metal arc welding (GMAW) safety.
- 6.2** In all feasible positions, makes a complete joint penetration weld on plain carbon steel using a short-circuit, pulsed-arc or spray transfer Gas Metal Arc Welding (GMAW) process.
- 6.3** Performs root- and face-guided bend tests on butt joint weld coupon.
- 6.4** Performs Magnetic Particle (MT) examination on a butt joint weld coupon.
- 6.4** Performs Liquid Penetrant (PT) examination on a butt joint weld coupon.

### **SAMPLE PERFORMANCE TASKS**

- Student will pass American Welding Society *GMAW* module written exam with a minimum score of 75%.
- Using the gas metal arc welding (GMAW) process of welding, complete an assigned project that incorporates design, fabrication, evaluation, and testing. Based on the instructor's decision, the project may incorporate welding processes other than gas metal arc welding (GMAW).
- Comply with safety rules and regulations in the handling and operation of welding equipment.
- Student will pass bend tests for AWS certification on coupons. Test for quality and strength of welds.

## **INTEGRATION LINKAGES**

Language Arts, Mathematics, English, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program (PDP)*, SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 7.0**

Students will make complete joint penetration groove welds on plain carbon steel in all positions using the flux cored arc welding (FCAW) process.

### **LEARNING EXPECTATIONS**

The student will:

- 7.1** Identify and explain safety procedures, equipment, equipment set up, and electrical current that apply to flux cored arc welding (FCAW).
- 7.2** Make complete joint penetration groove welds on plain carbon steel using the flux cored arc welding (FCAW) process in all feasible positions.
- 7.3** Conduct guided bend tests on flux cored arc welding (FCAW) coupons.
- 7.4** Conduct non-destructive examinations such as Magnetic Particle (MT) or Liquid Penetrant Inspection (PT) on samples of flux cored arc welding (FCAW) weldments.

### **PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET**

The student:

- 7.1A** Safely sets up equipment for flux cored arc welding (FCAW).
- 7.1B** Identifies and explains flux cored arc welding (FCAW) safety.
- 7.2** In all feasible positions, makes a complete joint penetration weld on plain carbon steel using the flux cored arc welding (FCAW) process.
- 7.3** Performs root- and face-guided bend tests on butt joint weld coupon.
- 7.4A** Performs Magnetic Particle (MT) examination on a butt joint weld coupon.
- 7.4B** Performs Liquid Penetrant (PT) examination on a butt joint weld coupon.

### **SAMPLE PERFORMANCE TASKS**

- Student will pass American Welding Society *FCAW* module written exam with a minimum score of 75%.
- Using the Flux Cored Arc Welding (FCAW) process of welding, complete an assigned project that incorporates design, fabrication, evaluation, and testing. Based on the instructor's decision, the project may incorporate welding processes other than Flux Cored Arc Welding (FCAW).
- Comply with safety rules and regulations in the handling and operation of welding equipment.
- Student will pass bend tests for AWS certification on coupons. Test for quality and strength of welds.

## **INTEGRATION LINKAGES**

Language Arts, Mathematics, English, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program (PDP)*, SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)

## **ADVANCED WELDING APPLICATIONS AND CERTIFICATION**

### **STANDARD 8.0**

Students will make complete joint penetration groove welds on various metals in all positions using the gas tungsten arc welding (GTAW) process.

### **LEARNING EXPECTATIONS**

The student will:

- 8.1** Identify and explain safety procedures, equipment, equipment setup, and electrical current that apply to gas tungsten arc welding (GTAW).
- 8.2** Make complete joint penetration groove welds on various metals using the gas tungsten arc welding (GTAW) process in all feasible positions.
- 8.3** Conduct guided bend tests on gas tungsten arc welding (GTAW) coupons.
- 8.4** Conduct nondestructive examinations such as Magnetic Particle (MT) or Liquid Penetrant Inspection (PT) on samples of Gas Tungsten Arc Welding (GTAW) weldments.

### **PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET**

The student:

- 8.1A** Safely sets up equipment for gas tungsten arc welding (GTAW).
- 8.1B** Identifies and explains gas tungsten arc welding (GTAW) safety.
- 8.2A** In all feasible positions, makes a complete joint penetration weld on plain carbon steel using the gas tungsten arc welding (GTAW) process.
- 8.2B** In all feasible positions, makes a complete joint penetration weld on stainless steel using the gas tungsten arc welding (GTAW) process.
- 8.2C** In all feasible positions, makes a complete joint penetration weld on aluminum using the gas tungsten arc welding (GTAW) process.
- 8.3A** Performs root- and face-guided bend tests on butt joint weld coupons.
- 8.4A** Performs Magnetic Particle (MT) examination on a butt joint weld coupon.
- 8.4B** Performs Liquid Penetrant (PT) examination on a butt joint weld coupon.

### **SAMPLE PERFORMANCE TASKS**

- Student will pass American Welding Society *GTAW* module written exam with a minimum score of 75%.
- Using the gas tungsten arc welding (GTAW) process of welding, complete an assigned project that incorporates design, fabrication, evaluation, and testing. Based on the instructor's decision, the project may incorporate welding processes other than gas tungsten arc welding (GTAW).
- Comply with safety rules and regulations in the handling and operation of welding equipment.
- Student will pass bend tests for AWS certification on coupons. Test for quality and strength of welds.



## **INTEGRATION LINKAGES**

Language Arts, Mathematics, English, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), *Professional Development Program (PDP)*, SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA).